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ABSTRACT

The Raven Progressive Matrices (RPM) were administered to groups of approximately 15 to 25 (for a total of 174) special class, educable mentally retarded Negro or white students, 5 1/2 to 10 1/2 years of age from low socioeconomic status (SES) backgrounds to determine whether individual or group training with learning potential procedure was more effective in improving RPM performance. A training booklet containing test items such as pattern completion and analogy problems was used by each S in two training sessions. Training criteria included strategies to assure child comprehension of task requirements, initial demonstration of task requirements, task requirement concretization in motoric performances (child drew item completing pattern before selecting alternative solutions), and verbal response of child on method of arriving at a solution. Results indicated that both the individually trained and group trained groups demonstrated higher mean increase than the control group; that pretest score, age, SES, race, and training condition were significantly related to posttest scores; that older students, males, or white children received higher posttest scores than younger students, females, or Negroes; that SES was not a significant predictor of performance following training; and that middle class students in special classes had physical involvements not clinically evident in low SES students. (MC)

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STUDIES IN LEARNING POTENTIAL

A COMPARISON OF GROUP AND INDIVIDUAL TRAINING PROCEDURES ON THE RAVEN LEARNING POTENTIAL MEASURE WITH BLACK AND WHITE SPECIAL CLASS STUDENTS

by

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A COMPARISON OF GROUP AND INDIVIDUAL TRAINING PROCEDURES ON THE RAVEN LEARNING POTENTIAL MEASURE WITH BLACK AND WHITE SPECIAL CLASS STUDENTS[1]

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The purpose of the study was to determine whether a training procedure involving groups of five to eight special class students was as effective as the individually administered learning potential (LP) procedure used in the past, with respect to improving performance on Raven's Progressive Matrices. Since Raven's Progressive Matrices has been found to be an effective learning potential measure with individually trained educable mentally retarded students (Budoff, 1972), the development of a group training procedure was considered important in increasing the cost-effectiveness of the LP procedure. A previous investigation with intellectually normal children (Corman & Budoff, 1973a) demonstrated that training in groups was as effective as individual training in improving the performance on the Raven measure by these students as a whole. The goal of this study was to replicate these findings with special class students.

Method

The sample consisted of 174 special class students

in five schools of an urban community in upstate New York. The students ranged in age from 67 to 176 months, with a mean age of 128.6 months (SD = 23.6). All but 5% were from low socioeconomic backgrounds (welfare, blue collar, or clerical) as indicated by father's occupation, and 43.4% were black. The mean IQ of the sample on the WISC or Stanford-Binet was 68.4, with a standard deviation of 9.0.

Procedure

Sets A, AB, B of the Raven Progressive Matrices were administered to students in groups of approximately 15 to 25, depending on the number of special class students in each school. In schools which contained more than 25 special class students, students were tested in two groups of equal size. Each student's sex, race, father's occupation, birthdate, and IQ were recorded from school records. On the basis of Raven scores attained at this test administration, each student was assigned to one of three groups: those which received group training, individual training, and no training (control group).

The assignment procedure for all students in each group tested was as follows: Raven scores of all students were rank ordered from low to high. In the event of tied scores, a rank position for the two scores was randomly assigned. The three students with the three highest scores constituted a block, and each student within this block was randomly

assigned to one of the three groups. Each of the three students with the three next highest scores was then randomly assigned to one of the three groups. This procedure was repeated for each block of three students until all students had been assigned to one of the three training groups. Since one third of the students in each group tested were assigned to the group trained group, each group training session involved five to eight students. All students were trained and posttested on Sets A, AB, B within a week after pretests had been given. White female testers and trainers were used throughout the study.

Training Procedure

Logical analysis of the test items indicates that pattern completion, orientation of elements, and analogy problems are readily identifiable types of problems in Sets A, AB, B. This observation was essentially confirmed by results of recent factor analyses of item responses of children in special and regular classes (Corman & Budoff, 1973b). A training booklet containing problems of these types was formulated and distributed to each child for use in two training sessions. The training procedure embodied the following practices and principles:

1. No problem which appears in Raven's Matrices was presented in the training booklet so that there was no specific training toward the actual test problems.

2. Great efforts were made to be certain that the child understood the demands made of him on the task. Hence, the training procedure was not a strictly standardized one but allowed for a number of variations to ascertain whether the child understood what was required before the conclusion was drawn that he was unable to master the particular type of item. Problems were presented in up to three different formats before training was discontinued.

3. The requirements of the task were demonstrated initially on materials that are pictorial and meaningful, i.e., incomplete American flag or a Campbell soup can for the pattern completion tasks. Successive problems in the training series required the child to deal with geometric forms in order to attune the child to the basic format of the matrices test presentation.

4. The requirements of the task were concretized in motoric performances, e.g., having the child draw the item that completes the pattern before perusing the various alternative solutions presented under the problems. In the double classification problems, it was found that children could easily derive one attribute at a time but often did not hold the first attribute in mind while they derived the second relevant attribute. During development of the training procedure, the child's understanding was facilitated by having him draw the relevant attributes, one at a time,

as he derived them. This helped concretize the elements of the solution process so that many children, after this type of practice, could do the double classification problems mentally with very little trouble.

It should be noted that when a child had difficulty drawing the designs, the trainer drew them for him.

5. During the training on the double classification problems, after the child ceased drawing the alternatives and began doing the problems mentally, the child was required to indicate verbally how he arrived at his solution on every third problem. This seemed to help the child maintain the quality of the solution process attained by the drawing and the trainer's accompanying verbalization. A minimal verbal response, often in combination with pointing responses by the child, sufficed to indicate to the trainer that the child was solving the problems.

Detailed presentation of the training procedure is available in Budoff, Corman, and Litzinger (1973).

Statistical Analyses

A stepwise multiple regression equation was performed with posttest score (R2) an the dependent variable. Seven independent variables were entered into the equation in the following order: (a) pretest score (R1); (b) Age; (c) Sex (coded 1 = male, 2 = female); (d) SES (rating of father's occupation on the Turner Scale (1964), coded from

0 = on welfare to 9 = managerial); (e) Race (coded 1 = black, 2 = white); (f) Training Condition = coached (membership in either training group, coded 1) versus noncoached (control, coded 2); and (g) Training group = membership in the group trained group (coded 1), the control group (coded 2), or the individually trained group (coded 3). The latter two variables represented orthogonal contrasts of the training group factor. Partial correlation coefficients of two-way interactions involving these seven variables, when the seven effects had been entered into the equation, were also obtained.

Results

Means and standard deviations of the three groups on the pretest and the posttest are presented in Table 1. The table indicates that the blocking procedure for assigning students to groups was highly effective in equalizing the initial means and variances of the three groups. It is evident that the control group improved slightly on the posttest, probably as a result of practice in taking the pretest. This group raised their score an average of 1.3 points from pretest to posttest. Both the individually trained and group trained groups demonstrated a higher mean increase than that of the control group: the mean of the group trained group increased 3.5 points, and the mean of the individually trained group increased 3.2 points from

pretest to posttest. The mean increases of the two trained groups, then, were similar to each other and greater than the average gain of the control group.

Insert Table 1 about here

Table 2 presents the results of the stepwise multiple regression equation on posttest scores. The percent of variance accounted for by all variables in the equation was 69.6 with 36.9% attributable to pretest score; the multiple r^2 was .696 (F = 51.34, df = 7/157, p <.001). Pretest score (R1), Age, Sex, Race, and Training Condition (membership in either trained group versus membership in the control group) were all significantly related to posttest scores. These effects were significant at the .01 level or beyond with the exception of Race, which accounted for 1% of the unique variance in R2 and was significant at the .05 level. The negative sign of the beta weight of the Training Condition factor indicated that subjects in either training group performed significantly better on the posttest than students in the control group. The fact that the Training Group factor was not significant (p = .299) indicated that there was no difference in posttest scores of students who received group or individual training. Older students, males, or white children achieved higher posttest scores than younger students, females, or blacks. The main effect of social class was not a significant predictor of performance following

training. This finding probably is due to the constricted SES range of the sample. Also, the usual finding is that middle class students in special classes often have various physical involvements not clinically evident in the low SES students.

Insert Table 2 about here

Inspection of the partial correlation coefficients between posttest scores and the 20 two-way linear by linear interactions, after main effects had all been entered into the equation, indicated that the following interactions were significant: (a) Sex X Training Group (r = -.165, p <.05), (b) Race X Training Group (r = .160, p <.05), (c) Social Class X Training Group (r = .214, p <.01), and (d) Social Class X Race (r = -.188, p <.05). Each of these interactions will be examined in turn in the discussion which follows.

Cell means in the Sex X Training Group interaction indicated that greater than expected improvement was shown by individually trained males, while females benefited more from group than individual training. Mean posttest scores of group trained males and individually trained males were 22.40 and 23.14, respectively. The girls' scores were generally lower, but those who were trained in groups attained slightly higher scores than those individually trained (20.13 and 18.89, respectively).

Means in the Race X Training Group interaction showed that there was a discrepancy between posttest scores of blacks and whites who were group trained (19.9 and 22.9, respectively) but no difference in posttest scores of individually trained blacks and whites (21.0 and 21.2, respectively). Whites in the control group attained a mean posttest score of 19.7 while the mean posttest score of black control subjects was only 17.8. Since both black and white control subjects had the same mean pretest score (17.7), white children gained more than black children merely from the experience of re-taking the test.

To examine the SES X Training Group interaction, SES was dichotomized into low SES versus others because of the markedly skewed distribution of SES level. The low SES group comprised children whose fathers were welfare recipients and unskilled workers (Categories 0 to 1 on the Turner Scale, 1964); the other SES group, which shall be referred to as "middle" SES, comprised the remainder of the sample which ranged from semi-skilled to professional workers (Categories 2 through 8). Posttest means of group and individually trained middle SES subjects and individually trained low SES subjects were similar (21.0, 21.5, and 21.2, respectively); the fact that the posttest mean of group trained low SES subjects was slightly lower (20.0) contributed to the variance

accounted for by the SES X Training Group interaction (r^2 = .04).

Means in the SES X Race interaction indicated a difference between posttest scores of black and white children at the lowest socioeconomic level (means = 18.3 for blacks and 21.3 for whites). At higher SES levels, means for blacks and whites were identical (20.4 and 20.3, respectively). The negative sign of the partial r for the SES X Race interaction is most likely due to the greater than expected improvement of low SES white children.

Discussion

The study has demonstrated that a group training procedure may be used with the Raven LP measure, and that, for students as a whole, results with special class students are similar to those that are achieved when these children are individually trained.

It is interesting to compare the results of this study with those of two previous investigations. Corman and Budoff (1973a) determined the effectiveness of group versus individual training with 202 intellectually normal children and found that children with low pretest scores benefited more from individual than from group training, when groups ranged from 12 to 15 students. These results suggested that a group training procedure might not be effective with special class students. Findings of the present study

revealed that for the sample as a whole, the posttest means of the two trained groups were very similar, the mean gains of the two trained groups were more than double the mean gain of the control group, and the interaction between pretest score (R1) and Training Group was not significant. These results indicate that for special class students as a whole the two training procedures are equally effective when groups consist of five to eight students. Individual training was more effective than group training, however, for those students who were male, black, or in the lowest SES range.

Another investigation (Budoff & Corman, 1973) with 379 intellectually normal children, in the same school system from which the present sample was drawn, sought to determine the effects of race and social class on posttest scores of these children. The methodology used was parallel to that of the present study, except that half the normal students were trained in groups of 6 to 13 and the other half received no training. Significant main effects were found to be pretest score, age, SES, and training. Although 53% of this sample were black, in contrast to findings with the special class sample, the main effect for race and all interactions involving race were found to be not significant. Middle class students in the normal sample

performed better on the posttest regardless of whether they were white or black. In this special class sample, on the other hand, the social class range was highly restricted and, without regard to race, social class was not a significant predictor of posttest performance. In this sample whites benefited more than blacks from both group training and practice in test taking. The discrepancy between posttest scores of blacks and whites was greater in the lowest socioeconomic range.

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Footnotes

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TABLE 1

Means and Standard Deviations of Three Groups on Raven Pretest and Posttest

Group	Pretest		Posttest		N
	$\bar{X}$	SD	$\bar{X}$	SD	
Group trained	17.929	5.861	21.389	7.268	56
Control	17.683	6.095	19.018	6.773	60
Individually trained	17.948	5.698	21.089	6.286	58

TABLE 2

Results of Multiple Regression on Posttest Scores

Variable	Beta	T-test	df
R1	.702	13.80***	157
Age	.137	2.74**	157
Sex	-.138	-3.06**	157
SES	-.045	-0.98	157
Race	.104	2.28*	157
Training condition (trained vs. nontrained)	-.148	-3.33**	157
Training group (group, control, or individual)	-.047	-1.04	157

$r^2 = .696$

$F = 51.34$, $df = 7/157$***

*$p < .05$

**$p < .01$

***$p < .001$